

# TUTORIAL

The QuickBird II optical satellite, launched October 18, 2001, offers the highest resolution satellite imagery that is currently available in the commercial market. QuickBird offers panchromatic imagery at up to 0.61m resolution, and multispectral imagery at 2.44m resolution. Data is distributed by DigitalGlobe - www.digitalglobe.com.

The following is brief tutorial on the use of Geomatica OrthoEngine for orthorectifying QuickBird Basis Imagery with the Rigorous Model and Rational Polynomial Coefficients (RPC).

#### **1.0 Rigorous Modeling**

The rigorous model is computed with GCPs and tie points.

#### 1.1 Project Setup

Start OrthoEngine, and click New on the File menu to start a new project. Give your project a file name, and select Satellite Orbital Modeling as the math modeling method. Under Options, choose Toutin's Model. After accepting this panel you will be prompted to set up the projection information for the output files, the output pixel spacing, and the projection of your GCPs. Enter the appropriate projection information for your project.

Project Information	Set Projection
Filename: C:\Testing\QB_Tutorial\QB_tutorial.prj Browse	Output projection
Name: New Project	UTM  Earth Model UTM 17 D000 More
Description:       Options         Math Modelling Method       Options         Aerial Photography       Toutin's Model: ASAR, ASTER, CBERS, EOC, EROS, ERS, FORMOSAT, IRS, IKONOS, JERS, LANDSAT         Polynomial       Thin Plate Spline         Rational Functions       AsaR/RADARSAT Specific Model         None (mosaic only)       Low Resolution: AVHRB	Output pixel spacing: 0.6000000 m Output line spacing: 0.6000000 m GCP Projection UTM  Earth Model UTM 17 D000 More <u>Set GCP Projection based on Output Projection</u>
OK Cancel	OK Cancel

## 1.2 Data Input

For rigorous modeling with Geomatica OrthoEngine, the user will need to order the "Basic" product, level 1B. "Standard" Imagery Products have a correction already applied, and therefore cannot be orthorectified. For more information on these products, please refer to Digital Globe's website - <u>www.digitalglobe.com</u>.

Data is delivered in Geotiff, NITF 2.0, and NITF 2.1. Geomatica OrthoEngine supports all three of these formats. The data is also delivered with a number of support files (ATT, EPH, GEO, IMD, RPB, and TIL). These support files need to reside in the same directory as the image data when reading the data.

Depending on the media delivery method you choose, you may have to copy or extract your data to your hard drive. After successfully copying your data to your hard drive, proceed to the Data Input processing step. Choose Read CD-ROM data. (Note that we are treating this data as if it is on CD-ROM, even though it is actually on your hard drive.)

Set CD format to QuickBird, select your Tiff or NITF image file, and press the appropriate channel buttons (1 for a PAN image, or 1-4 for multi-spectral, depending on what was ordered). Specify an output filename, a scene description, and a report file name. This step will convert the file to .pix format, and add the information needed for modeling.

## **1.3 Collect GCPs and Tie Points**

Select the GCP/TP Collection processing step. Collect GCPs for the project using manual entry, from geocoded images, vectors, chip databases, or a text file. You can also collect tie points, if you need to pull multiple scenes together.

For the QuickBird rigorous model you will need a minimum of six accurate GCPs per scene and possibly more, depending on the accuracy of the GCPs and accuracy requirements of the project. Once you have collected your GCPs, run the model calculation and proceed to the residual report panel (under the Reports processing step) to review the initial results.



😹 Read CD-ROM	
Data Source	
CD Format:	QUICKBIRD (TIFF, NITF, PCIDSK)
Select CD image filename:	C:\QuickBird\02APR18160856-P1BS-000000000813_000
Requested channels:	1 2 3 4
SAR Type:	C ERS C RADARSAT
Data Output	
PCIDSK filename: C:\Quick	Bird\RH_pan.pix Browse
Create linked file: 🔿 Yes	⊙ No
Report filename: RH_pan.r	pt Browse
Scene description: Pan Quic	kBird
<u> ?</u>	Read Close

GCP Collection for middle_pan				
Ground control source: Manual entry				
Filename: Browse				
DEM: Browse				
V Auto locate Compute model				
Working Image: middle_pan				
Point Projection: UTM 17 D000				
Point ID: G0004 🗾 GCP 🖃				
Image pixel: 5484.0 +/- 0.1 P				
Image line: 18294.5 +/- 0.1 L				
Easting (X): 628001.110 +/- 1.000 m				
Northing (Y): 4855910.660 +/- 1.000 m				
Elevation [Z]: 197.300 +/- 1.000 m				
Annual Data New Drive Florest Florest				
Accept Delete New Point Extract Elevation				
Reference Images				
Image ID Status				
Accepted Points: 29 Total				
Residual units: C Ground I Pixels BMS: 1.06 X BMS: 0.75 Y BMS: 0.75				
Point ID Residual ResX ResY Type Im.				
G0057 1.48 -1.46 0.20 GCP				
G0004 1.37 1.35 -0.27 GCP				
G0013 1.36 0.06 1.36 GCP				
stauu53 1.27 -1.07 -0.69 GCP				
C0000 1.20 -0.24 -1.18 GCP				
G0012 118 .0.64 1.00 GCP				
Close				

Updated: 1/25/2006

The information in this document is subject to change without notice and should not be construed as a commitment by PCI Geomatics. PCI Geomatics assumes no responsibility for any errors that may appear in this document. Copyright © 2006 PCI Geomatics inc. All rights reserved.

### 1.4 Generating Orthos

The final step is to set up your Ortho Image Production. Proceed to the Ortho Generation processing step, select the files to be processed, select the DEM file to be used, set your processing options, and you are ready to create your orthos.

😹 Ortho Image Production	<u>×</u>
Available images: left_pan : Ortho done right_pan : Ortho done	Images to process:  middle_pan: Delete existing file
Image information for middle_pan	O the lease
Image: middle_pan.pix Status: Model up-to-date Input channels:	File:       omiddle_pan.pix       Browse         Status:       Ortho matches computed model       Browse         File:       exists.       Will DELETE existing ortho file.         Size:       1 x 30060 x 81430 16-bit unsigned (4669 MB) (Estimate)         Upper left:       624337.8000       X 4868186.4000         Y       Lower right:       642373.8000
Ortho Generation Options	
Proce	ssing Options Processing Start Time
Browse Source: 1: torontodem.pix Workin	ng cache: 256 Am MBytes RAM Start now
Elevation scale: Besar	ng intervat 14 T 12 400 T Cubic
Elevation offset:	adiometric Correction:
Elevation unit: Meter C Feet	iize: X 🕂 Y
Brow	se Kemel file:
<u>&gt;?</u>	Generate Orthos Close

#### 2.0 Rational Polynomial Coefficients (RPC)

QuickBird data is delivered with RPCs, which can be used in the absence of adequate GCPs. The addition of 1-4 GCPs to your project file in addition to the RPCs can geatly improve the accuracy of your final ortho. RPC modeling in OrthoEngine is similar to processing with the rigorous model, but differs in project setup and data input.

#### 2.1 Project Setup

Start a new project and set the math modeling method to Rational Functions. Under Options, select Extract from Image File. For QuickBird data, the RPCs are actually stored outside the image file (.RBP), but OrthoEngine will seek out this file in the image data directory.

Updated: 1/25/2006

The information in this document is subject to change without notice and should not be construed as a commitment by PCI Geomatics. PCI Geomatics assumes no responsibility for any errors that may appear in this document. Copyright © 2006 PCI Geomatics inc. All rights reserved.

Project Information	×
Filename: C:\Testing\QB_Tutorial\Qu	iickBird_RF.prj Browse
Description: Rational Functions QuickB Math Modelling Method C Aerial Photography C Satellite Orbital Modelling C Polynomial Thin Plate Spline Rational Functions None (mosaic only)	ird tutorial ptions Compute from GCPs Extract from Image File: NITF, IKONOS, ORBVIEW, QUICKBIRD
<u></u> ?	OK Cancel

#### 2.2 Data Input

Proceed to the data input window and use the Open Image panel to bring the data into the project with the New Image button. You will select the image file, OrthoEngine will find the .RPB file and add the coefficients to the project.

🔛 Ope	n Image					×
🖲 Un	corrected image	s 🗢 Ortho	images			
02APF	R10161956-M1E	S-0000001162	259_01_P00	1: \\Eros\(	QUICKBIRD\TOP	RONTO\RA
•						Þ
					I	
<u> </u>	Quick Open	Quick Open (	& Close	Open	New Image	Close

You can review the coefficients by going to the project report under the Reports processing step. Under Image Information, select Geometric Model.

Updated: 1/25/2006

The information in this document is subject to change without notice and should not be construed as a commitment by PCI Geomatics. PCI Geomatics assumes no responsibility for any errors that may appear in this document. Copyright © 2006 PCI Geomatics inc. All rights reserved.

🐜 Project Report	
Options	
Project Information Image information Point informati	on Introl points
Control Contro	nitor points
Images:	DONTOVDAVYD
024PR10161996-M185-000000116293_01_P001; \\El0s\Q01CKBIRD\110	RUNTU\RAWDI
Report -	
Project Report for QB	<b>_</b>
General project information	
Filenana : OuiskPind PE ani	
Description : Rational Functions QuickBir	d tutori
Image 02APR10161956-M1BS-000000116259_01_P001	
Line_Offset : 3.7670000000000000	+003
Sample_Offset : 3.4410000000000000 Latitude Offset : 4 3874899999999999	+003 +001
Longitude_Offset : -7.95298999999999998 Height Offset : 2 110000000000000	e+001
Print to Fil	

## 2.3 GCP Collection

At this point you can proceed right to the ortho generation stage if you do not have GCPs. The model will be computed based on the supplied RPCs. If you do have a few GCPs, you can proceed to the GCP collection stage to add these to your project. The model will be updated automatically, and you can review these GCPs in the residual report panel.

#### 2.4 Ortho Generation

The final step is to set up your Ortho Image Production. Proceed to the Ortho Generation processing step, select the files to be processed, select the DEM file to be used, set your processing options, and you are ready to create your orthos.

Updated: 1/25/2006

The information in this document is subject to change without notice and should not be construed as a commitment by PCI Geomatics. PCI Geomatics assumes no responsibility for any errors that may appear in this document. Copyright © 2006 PCI Geomatics inc. All rights reserved.